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DRAWINGS ATTACHED

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(54) COATING MACHINE

(71) I, RAYMOND ANGOLD, a Canadian citizen of 179 Fairway Hill Crescent, Kingston, Ontario, Canada, do hereby declare

the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a coating apparatus in a broad sense, and more particularly, though not exclusively, to coating apparatus of the type normally used for applying a coating of an edible material onto an article of food. In a preferred form, the present invention provides an apparatus which is particularly useful in coating pieces of chicken, fish, scallops or other such articles of food with a mixture of flour and spices, or with cornmeal, or bread crumbs, or other similar edible coating material prior to cooking such food, for instance, in a deep-frying cooker.

One known arrangement for coating articles of food with an edible coating material involves the manual dipping, piece by piece, of the article of food into a suitable solution, for instance, a solution of water, powdered milk and powdered eggs for moistening the same. The article of food is then shaken to remove the excess solution or "wash" as it is often referred to, and again dipped piece by piece into the coating material, a mixture of flour and spices, or cornmeal, or bread crumbs. The edible coating material adheres to the premoistened piece of food which is then ready for cooking.

It will readily be understood that the operation described above may frequently involve a relatively large staff and much handling of the articles of food especially if any appreciable amount of volume of food is to be coated. This type of operation for coating articles of food may be carried out, for example, in a hotel or restaurant kitchen, in a plant which prepares frozen foods, in what is known as a commissary operation, i.e., the preparation and cooking of food for hospitals, conventions or the like, and other such places where food is either cooked, or being prepared for cooking at a later time, and so on. Moreover, in the piece by piece handling of food as mentioned above, it is doubtful that each piece of food so treated will be coated uniformly, a factor which can detract from its final taste and/or appearance. Finally, because the articles of food are continually being handled by the kitchen staff, for instance, there is a constant problem of maintaining good cleanliness. Contamination of the coating material might also occur, as well as a potentially inefficient use made of this material. That is to say, excessive amounts of coating material may be used unintentionally simply for reasons of expediting a speedy operation compatible with the demands made by customers upon the staff whose job it is to prepare the food.

It is therefore an object of the present invention to provide an improved coating apparatus which will reduce some of the problems previously mentioned.

It is also an object of this invention to provide apparatus which is relatively simple in construction, and is easy to operate and maintain. The apparatus to be particularly described herein can readily be cleaned, thereby assisting in maintaining high standards of cleanliness.

Accordingly, in a broad form of the present invention, according to a first aspect thereof, there is provided apparatus for coating articles with material in flowable form, the apparatus comprising a drum having an inlet for receiving the articles and an outlet for discharging the coated articles and at least a first and second coating zone intermediate the inlet and outlet for applying coating materials to the articles, the said zones being spaced apart longitudinally of the drum and the drum being disposed adjacent a supply of the coating material or materials; support means for both carrying the drum and enabling it to be selectively rotated, the drum being separable from the support means; article conveying means interiorly of the drum for tumbling and moving the articles longitudinally of the latter; and scoop means secured to the ex-

terior of the drum and rotatable therewith for contacting the supply or supplies of coating material to pick up a predetermined quantity thereof, the arrangement being such that subsequent rotation of the drum enables the material in the scoop means to be discharged by gravity into the drum through apertures therein to coat the articles being tumbled therein.

According to a second aspect of the invention, a method of coating articles with material in flowable form comprises introducing the articles successively into a rotatable drum and simultaneously tumbling them therein by rotating the drum, causing them to progress from an inlet at one end of the drum to an outlet at the other end thereof and causing the said material to be scooped up out of a reservoir thereof exterior to the drum and to fall under gravity on to the articles through apertures in the surface of the drum.

It will be apparent that certain refinements and modifications can be made to such apparatus. In a more preferred embodiment, therefore, the present invention provides apparatus for coating an article of food with an edible coating material, comprising: drum means having an inlet and an outlet respectively for receiving and discharging the articles of food, and at least one perforated region extending circumferentially of the drum means and being intermediate the inlet and outlet, the drum means being rotatably mounted on a supporting surface and being positioned adjacent a supply of the edible coating material; drive means for rotating the drum means; conveyor means for effecting movement of the article of food longitudinally of the drum means while said article is being tumbled therein; and scoop means fixedly secured to the drum means exteriorly thereof to be rotatable therewith, such scoop means being secured to the drum means in an upstream perforated region, and being adapted to pick up a predetermined quantity of the edible coating material from said supply thereof and distributing such material by gravity over the tumbling article of food to coat the same substantially uniformly.

These and other forms and modifications of the present invention will now be described in greater detail. Reference will be made to the accompanying drawings which illustrate a preferred embodiment of the invention, by way of example only, and in which:—

Figure 1 is a side elevation view showing a coating apparatus of the type contemplated herein;

Figure 2 is an end elevation view of the apparatus of Figure 1 as seen when looking from the discharge or outlet end towards the inlet of such apparatus;

Figure 3A, B and C are schematic views showing some possible variations in the form of the *inner* end walls of each of the scoops on the present apparatus, and Figure 3D shows one form of *outer* end wall;

Figures 4A, B and C are also schematic views showing some alternative forms of an inlet baffle arrangement of the type which may be used in the apparatus of Figure 1, Figure 4A showing a conical cross-section;

Figure 5 is an enlarged elevation similar to that shown in Figure 2, but including a feed hopper for continually replenishing a mixture of flour and spices as such mixture is consumed in coating articles of food passing through the coating apparatus; and

Figure 6 is an enlarged plan view showing in detail one form of an agitator which might be used with the feed hopper of Figure 5.

Turning now to the drawings, the numeral 1 designates the coating apparatus overall and such apparatus is shown as being mounted on a support surface 2 of a table or bench 3. It will be noted that the coating apparatus 1 is positioned towards one end of the table 3, and this is done in order to accommodate a receiving tray or receptacle 4 which catches the pieces of chicken, fish or other food that has been coated in the apparatus 1 as it is discharged therefrom. The table 3 is preferably of about standard height, namely, in the order of 30 inches, and hence reduces the amount of bending over of the kitchen staff or other operating personnel when they are working with the coating apparatus 1. One prototype of the coating apparatus 1 which has successfully been operated, together with the table 3, occupied a space approximately six feet long by two feet wide, and hence would be well suited for use in a restaurant or hotel kitchen. It will be obvious, however, that the physical dimensions of either the coating apparatus 1 or the table 3 may be decreased or increased in order to efficiently accommodate the volume output in terms of numbers of pieces of food which must be coated in order to satisfy the demands made by customers or consumers on the operating personnel. A coating apparatus which is intended for use in a large plant where, for instance, frozen foods are being prepared, or are being cooked in a large central kitchen for distribution elsewhere as a type of catering service, will clearly require a much greater volume output than a similar apparatus used in a restaurant or take-out store. Moreover, it will also be obvious that two or more units smaller in size might preferably be used, say, in a hotel or restaurant kitchen instead of a single large unit simply for reasons of making an efficient use of the space available in such kitchens. It is therefore to be recognized that the coating apparatus 1 can be dimensionally modified in

order to produce an apparatus which would be most compatible with the particular type of food-preparation operation in which such apparatus is intended to be used.

Since it may frequently be desirable to move the coating apparatus 1 from one location to another, the table 3 would preferably be provided with castors or rollers (not shown) which can be locked to prevent unintentional movement thereof should someone accidentally bump into the same. It will also be noted that the support surface 2 serves to carry receptacles or containers 6 and 8 which will further be described below.

A feed hopper 10 for the pieces of fish, chicken or other types of food to be coated is also supported on the table 3, by means of a base structure 11. This feed hopper 10 is normally funnel-shaped and will usually be of a size containing enough pieces of food that it is compatible with, and makes for an efficient operation of the coating apparatus 1, relative to the through-put capacity normally required of it. For the comfort of the kitchen staff or other operating personel, this feed hopper 10 will normally be positioned at a height such that excessive reaching, especially upwards, by such persons is largely avoided. The feed hopper 10 can conveniently be of a smooth interior surface such that the pieces of food simply slide by gravity towards the inlet 12 of the coating apparatus 1. For ease of cleaning the same, the feed hopper 10 can be removably mounted on the base structure 11. Depending upon the through-put capacity required of the coating apparatus 1, some other more sophisticated feed means, such as an auger, or conveyor, can also be used in conjunction with or as a replacement or alternative for the feed hopper 10.

In the specific embodiment of the coating apparatus 1 shown in Figures 1 and 2, the inlet 12 comprises an annular inlet opening 14 surrounding a generally circular baffle plate 15. Although the converse arrangement of a central circular opening surrounded by an annular baffle plate could alternatively be employed, the arrangement having an annular opening surrounding a generally central baffle plate has been found to function more efficiently. It will, however, be apparent that other specific shapes and arrangements of an inlet opening and a baffle plate could also be used. Several such alternative arrangements are shown in Figures 4A—C. It is desirable, in any case, that the inlet opening and baffle arrangement be such that good control be achieved in respect of the number of pieces of food entering the inlet 12 from the feed hopper 10, or other source supplying such pieces of food. Such control will, of course, be of greater importance in an operation where a large volume output is required of the coating apparatus 1, for example, in an operation for preparing foods for freezing or for catering services.

The coating apparatus 1 comprises a main body or drum 16 which is provided with a somewhat enlarged, solid central portion 18 having a friction surface 18^1 generally centrally thereof in order that the drum 16 can be rotatably driven from suitable drive rollers as described below. This central portion 18 can be either an integral part of the main drum 16, or it can be removably attached thereto in a sleeve-like manner. The main body or drum 16 can conveniently be manufactured from a piece of expanded metal, which may be of aluminum or stainless steel, for instance, or it could be manufactured from a solid sheet of such metal, but which has been slit, cut, punched or otherwise apertured to provide at least one perforated region 17 which extends circumferentially around the entire drum 16. As yet another alternative, the apertured or perforated region 17 could be formed by providing a wire mesh or the like over a suitable gap or cut-out portion in the main body or drum 16. The sheet of metal is then rolled into a generally cylindrical configuration and seam welded, or otherwise joined to provide the main body or drum 16. This main drum 16 is preferably structurally self-supporting, however, if necessary, re-inforcing rib members could be provided externally of the drum 16 and extending generally longitudinally therealong. Depending upon whether the main drum 16 is made up from a sheet of expanded metal, of what is basically a self-supporting wire mesh with solid regions provided thereon, or from a solid sheet of metal and subsequently drilled, stamped or otherwise apertured, the solid central portion 18 will be either integral or rigidly secured to the drum 16 by welding or other similar conventional fastening techniques. It will also be noted from Figure 1, that the central portion 18 is provided with a plurality of radial flanges 19 extending outwardly and continuously around the periphery of the main drum 16. The function of these flanges 19 will be described further below.

As previously mentioned, the solid central portion 18 is adapted to engage a drive mechanism which enables the coating apparatus 1 to be rotated, conveniently from about five to twenty rpm, for example, in order to gently tumble the article of food therein. To this end, the solid central portion 18 of the main drum 16 is adapted to sit on and be supported by a plurality of rollers 20 which are attached to the support surface 2 of the table 3. Although only four such rollers 20 are indicated in Figures 1 and 2 as being in engagement with the central portion 18, it will be obvious that additional rollers can be provided if desired. Additional support rollers may also be provided for example,

adjacent the inlet and outlet ends of the main drum 16 in order to provide adequate support along the entire length thereof.

For purposes of example only, the front rollers 20 of Figure 1, or the left-hand rollers 20 as seen in Figure 2 are mounted on a common shaft 21 which is provided with a drive pulley for engaging a belt drive 22 that is operatively connected to and driven through a reducer unit 23 by a motor 24. For convenience, the drum 16 will normally be driven by an electric motor such as 24 and will have an on-off or other such controls associated with it. Since the operating speed of such a motor 24 is usually very much greater than the 5—20 rpm needed on the rotating main drum 16, a reducer unit such as 23 will be needed in most installations. This reducer unit 23 can be made up from a series of intermeshed gears, of belts and pulleys, or some other similar arrangement which will provide the speed reduction in a convenient manner. The rear and right-hand rollers 20 shown respectively in Figures 1 and 2 may also be in driven engagement with the belt 22, reducer unit 23 and motor 24 if it is desired.

The solid central portion 18 will normally have a sufficiently rough surface 18^1 that engagement with the supporting and drive rollers 20 will provide sufficient friction to enable the rollers 20 to drive the main drum 16. These rollers 20 can be made of or coated with rubber, plastics or the like, and it would be evident that some roughening, such as by knurling or cross-hatching of the friction surface 18^1 can be provided to ensure that adequate friction is generated by engagement of the rollers 20 with the same. In yet another alternative form, a ring gear might be provided circumferentially on the solid central portion 18 and will be driven by a pinion gear which is operatively connected to the motor 24. Clearly then, various arrangements are possible for driving the main drum 16.

In a preferred embodiment of the coating apparatus 1, the main drum 16 merely sits by virtue of its own weight in supported engagement on the rollers 20, with such rollers providing only a supporting function and doing nothing to retain the drum 16 in contact therewith. Accordingly, in this form of the coating apparatus 1, the main drum 16 can very readily be removed from the support surface 2 and taken to a cleaning area for steam cleaning or washing down by some other method. It will therefore be evident that the inlet 12 of the coating apparatus 1 will normally provide a spaced-apart, but overlapped connection or communication with the discharge spout of the feed hopper 10.

An important feature of the present coating apparatus 1 is the provision of a number of dish-out scoops 30 and 32 which are rigidly attached to the exterior of the main drum 16 by welding or other known fastening techniques. Moreover, these scoops 30 and 32 will be secured to the main drum 16 in what will be referred to, in the context of the present application, as "coating zones". Accordingly, the apertured or perforated regions 17 as previously described will in some instances make up or cover the entire coating zone, whereas in other cases the apertured or perforated region 17 may comprise only one portion of a coating zone. In the particular embodiment shown in Figures 1 and 2, two coating zones are provided, one associated with the scoops 30 and the other associated with the scoops 32. In this particular case, the upstream coating zone associated with the scoops 30 is entirely made up of a perforated or apertured region 17; whereas the downstream coating zone associated with the scoops 32 is made up of both a perforated or apertured region 17 and a solid region 17^1. It will be apparent, however, that various other configurations involving solid and apertured or perforated regions may be provided depending somewhat upon the specific food which is to be processed, i.e., coated using the present coating apparatus 1.

The coating apparatus 1 shown in Figures 1 and 2 is provided with a pair of scoops 30 disposed radially on oposite sides, i.e., diametrically opposed, on the main drum 16 and are provided with side, end and bottom walls integrally interconnected to enable the same to contain a predetermined quantity of the edible coating material. The innermost end wall 31 will be provided with apertures of, say, $\frac{1}{2}$ inch diameter, vertical or horizontal slits, or with other shaped openings; while the outer end wall may be cut away leaving only a shallow lip 31^1 (Figure 3D) extending upwardly from the bottom wall. Despite the particular form which the apertures in the innermost end wall 31 will take, normally there is in effect some form of a shallow lip provided in order to promote the spilling by gravity of the coating material from the scoop 30 with a farther throw inwardly towards the center of the main drum 16. The lip 31^1 in the outer end wall serves to limit the quantity of coating material being picked up. As indicated in Figure 1, the scoops 30 extend radially outwardly of the coating apparatus in the "upstream" perforated region 17, and upon rotation of the main drum 16 will dip down into the reservoir or container 6 which contains an edible coating material to be applied to the articles of food. The exact geometric shape of both the scoops 30 and 32, and of the reservoirs 6 and 8 is largely a matter of choice, and the forms shown in Figures 1 and 2 is to be considered as exemplary only. The scoops

32 are normally identical in construction to the scoops 30 and for purposes of dynamic balance, are preferably the same in number and disposed at 90 degrees relative to the scoops 30. Normally, there will be at least two diametrically opposed scoops 30 and two diametrically opposed scoops 32, however, this can of course, be modified. In a broad sense therefore, both the scoops 30 and 32 will preferably be provided in symmetrical arrangement, primarily for purposes of maintaining better balance.

The reservoirs 6 and 8 will usually be provided with side-wall extensions 33 which extend upwardly and outwardly in order to minimize the loss by dripping or splashing of the coating material down onto the support surface 2 or even the floor on which the table 3 is sitting. The peripheral flanges 19 on the solid central portion 18 of the coating apparatus 1 serve two basic functions. In broad terms, these peripheral flanges 19 locate the main drum 16 longitudinally, as well as preventing seepage or undesired leakage of the coating material either upstream or downstream of the respective reservoirs 8 and 6. It will be seen from Figure 1 that two of the exterior peripheral flanges 19 are provided just slightly outboard, taken longitudinally, of the drive rollers 20 and hence serve to maintain the coating apparatus in a substantially fixed location relative to the rollers 20 which are secured to the table 3. Moreover, the outermost external peripheral flanges 19 also serve to turn back any coating material which might otherwise tend to leak or seep along the exterior surface of the main drum 16. The internal peripheral flange 19 is disposed in the space provided between the solid central portion 18 and the outer surface of the main drum 16 and functions as a baffle to prevent movement of coating material in either direction longitudinally of the coating apparatus 1. In particular, the inner peripheral flange 19 serves to prevent coating material from the reservoir 6 from travelling downstream in the main drum 16 and hence "contaminating" the coating material in reservoir 8. Using such an arrangement of peripheral flanges, any tendency for one coating material to "contaminate" the other is at least significantly reduced and to a very large extent, eliminated almost entirely. The external outermost flanges 19 also prevent any coating material from getting onto the friction surface 18^1 of the drum 16 and hence prevent any possible slippage of the drive rollers thereon.

In order to ensure positive tumbling action of the particles of food, as well as to convey or propel the same longitudinally of the coating apparatus 1, a plurality of conveyor vanes or paddles 26 are provided interiorly of the main drum 16. These conveyor vanes 26 are fixedly secured to the interior of the main drum 16, and are positioned in a predetermined orientation relative thereto. Although the exact shape of each of the conveyor vanes 26 can be varied, it will be apparent that for purposes of efficient operation, such conveyor vanes will be positioned uniformly around the inner periphery of the coating apparatus 1. Moreover, it is highly preferable that although the conveyor vanes 26 will be sequentially positioned, there is a distinct separation or gap from one vane to another. In other words, although the conveyor vanes 26 could be disposed generally in a parallel, linear arrangement as shown in Figure 1, or they could be secured spirally of the interior of the drum 16, there will in all cases be a positive gap or separation from one vane to the next. This gap or separation is provided to ensure that there is no tendency for coating material to remain trapped on such conveyor vanes, as it could in the case of a *continuous* spiral vane and hence be carried downstream from say the reservoir 6 to contaminate or mix with another coating material in the reservoir 8.

As indicated previously, the present coating apparatus 1 is well suited for processing chicken pieces and the like prior to deep frying of the same. In the present instance, therefore, the pre-cut pieces of chicken or other articles of food are placed into the feed hopper 10, from which they travel preferably by gravity to the inlet 12 and subsequently in a controlled fashion through the inlet opening 14 into the interior of the main drum 16. Here, the pieces of food are contacted by the conveyor vanes 26 causing them to be tumbled gently, and also to be conveyed or propelled generally longitudinally of the coating apparatus 1. As the main drum 16 rotates, so do the scoops 30 and 32 which are fixedly secured thereto. Accordingly, as the scoops 30 rotate, each one in its turn dips down into the reservoir 6 and picks up a predetermined quantity of the coating material contained therein. This predetermined quantity of coating material can vary depending upon the height of the side and ends walls (i.e. lip 31^1) or dependent upon any apertures which may be provided in the same. In connection with an operation for preparing pieces of chicken for deep frying, the reservoir 6 will usually contain a wash consisting of a solution of water, powdered milk and powdered eggs. As the scoop 30 continues rotating upwardly towards, and beyond a horizontal position, the coating material or wash contained therein will begin to overflow the effective inner lip, or through the apertures in the innermost end wall (depending on which is being used), and spill by means of gravity down through the apertured and perforated region 17 and onto the tumbling articles of food

within the drum 16. Because there are generally at least two scoops 30, and the angular placement of the conveyor vanes 26 is not too steep, enough wash will be spilled and splashed down onto the tumbling articles of food (pieces of chicken) to uniformly coat the same with the wash, i.e., to well moisten the same. Any excess wash drips and falls off the tumbling articles of food through the perforated region 17 which, in Figure 1 extends throughout the entire upstream coating zone, and either directly into the reservoir 6 or onto the wall extensions 33 and interior of solid portion 18 to be indirectly conveyed back to the reservoir. As previously mentioned, the outermost peripheral flanges 19, the internal peripheral flange 19 and the separate or discontinuous conveyor vanes 26 ensure that substantially no wash is carried downstream either by the revolving drum 16 or such vanes 26.

As the pieces of chicken are moved downstream longitudinally in the coating apparatus 1, they reach a second coating zone where, the scoops 32 are rigidly connected to a solid portion 17^1 which is upstream of the apertured or perforated region 17. In this second coating zone, the moistened articles of food are now "powdered down" with a dry coating material which, in the case of pieces of chicken, is usually a mixture of flour and spices. The coating operation involved here is similar to that previously described. That is to say, as the scoops 32 revolve with the drum 16, they travel down into the container 8 and pick up a predetermined quantity of the dry coating material, limited by lip 31^1. Subsequently as the scoops 32 pass upwardly to and beyond a horizontal position, this dry coating material spills through the narrow slits, or over the effective lip in the inner end wall 31, or whichever alternative apertured arrangement is provided in such end wall; and by gravity spills downwardly onto the tumbling pieces of chicken to coat the same. Because these scoops 32 are attached to the drum 16 in a solid portion of the second coating zone, the dry coating material which is spilled into the drum 16 does not immediately spill out of the same. The pieces of chicken are therefore tumbled over in the dry coating material contained in this solid portion of the second coating zone and substantially thorough and uniform coating of such pieces of chicken is ensured. Because the apertured or perforated region 17 is provided immediately downstream of the solid region 17^1, any excess of dry coating material which does not stick to the pieces of chicken drops downwardly through the perforations and into the container 8. The coated article of food, i.e., the pieces of chicken, are now discharged through an outlet opening 28 and into the receptacle 4.

Figures 5 and 6 show one simple arrangement for supplying large amounts of the dry coating material to the reservoir 8. Here, a hopper reservoir 50 is provided, mounted on the table 3 adjacent the reservoir 8. This hopper reservoir is formed with an outlet 52 which can be variable in size to regulate the dispensing of coating material to reservoir 8. In the case of flour, there is a tendency to stick or pack, and to preclude, this, an agitator assembly 55 is provided. The agitator assembly 55 basically comprises a kick arm 56 which is engaged by a lug 58 secured to the side wall of each scoop 32; and a scoop rod 60 which is disposed in outlet 52. As each scoop 32 rotates with the main drum 16, the lug 58 contacts kick arm 56 pushing it along and, because of the pivotal linkages 62, simultaneously drives the scoop rod 60 downwardly through the outlet 52 to at least loosen the flour collected there. This will ensure easy dispensing of flour, for instance, from the hopper reservoir 50 to the reservoir 8. Figures 5 and 6 show an elementary form of hopper reservoir and agitator assembly, using only simple linkages and biasing springs. Other much more sophisticated arrangements can also be used, involving augers or screw conveyors and the like.

It will be apparent that minimum handling of the articles of food by operating personnel in either the kitchen or food processing plant will likely occur when the coating apparatus 1 is being used. The pieces of chicken or other types of food are normally precut and are received in sanitary containers. Similarly, the wash and flour-spices mixture need only minimal handling. Hence, high standards of cleanliness will be possible, while still maintaining a speedy and efficient coating operation. Moreover, because the feed hopper and main drum sections of this apparatus 1 are readily removable, cleaning of these parts can be done quickly and in a place distant from the grease, fumes, et cetera of a busy kitchen or plant. This is particularly advantageous since these parts are continually contacting the articles of food.

It will also be apparent that the present apparatus will be quite simple to construct with minimum costs being possible. Depending upon the actual physical size of the coating apparatus 1, as determined by the kitchen or plant operation where such apparatus is to be used, a relatively inexpensive motor can be used with a simple belt and pulley, reducing gear and drive roller arrangements. These parts are easy to maintain, service and replace if and when necessary.

The foregoing description has disclosed one particular form of the present coating apparatus, and has suggested some modifications thereto. Other modifications and alternative structures will also be possible

within the scope of this invention. It is contemplated, therefore, that all such changes and alternatives are to be comprehended within the scope of the invention, as defined by the appended claims.

WHAT I CLAIM IS:—

1. Apparatus for coating articles with material in flowable form, the apparatus comprising a drum having an inlet for receiving the articles and an outlet for discharging the coated articles and at least a first and second coating zone intermediate the inlet and outlet for applying coating materials to the articles, the said zones being spaced apart longitudinally of the drum and the drum being disposed adjacent a supply of the coating material or materials; support means for both carrying the drum and enabling it to be selectively rotated, the drum being separable from the support means; article conveying means interiorly of the drum for tumbling and moving the articles longitudinally of the latter; and scoop means secured to the exterior of the drum and rotatable therewith for contacting the supply or supplies of coating material to pick up a predetermined quantity thereof, the arrangement being such that subsequent rotation of the drum enables the material in the scoop means to be discharged by gravity into the drum through apertures therein to coat the articles being tumbled therein.

2. Apparatus according to Claim 1, wherein the drum has a surface area in each coating zone which is perforated, the perforated areas being separated by a region impervious to the coating material or materials.

3. Apparatus according to Claim 1 or Claim 2, wherein the drum includes flange means thereon for restricting or preventing movement of coating material in a direction downstream of the drum.

4. Apparatus according to any one of the preceding claims, wherein the conveying means comprises a series of vane segments spaced slightly apart axially of the drum for preventing or restricting movement of coating material in a direction downstream beyond the coating zone in which it is applied to the articles.

5. Apparatus according to any one of the preceding claims, wherein the inlet comprises baffle means and an annular opening in communication with a feed hopper which supplies the articles to the drum, each baffle means and annular opening serving to control the input of articles to the drum.

6. Apparatus according to any one of the preceding claims, wherein there is an upstream and a downstream coating zone, the upstream coating zone being a perforated region extending circumferentially of the drum and having a first set of scoops secured therein on the exterior of the drum, the downstream coating zone including a solid portion and a perforated portion, the solid portion being upstream of the perforated portion and having a second set of scoops secured thereto exteriorly of the drum, the scoops in each zone providing access to the interior of the drum.

7. Apparatus according to any one of the preceding claims, wherein the scoop means comprises a series of dished-out scoop elements having side, and inner and outer end walls, the inner end wall being apertured to allow for discharge of the coating material therefrom and the outer end wall being of a selected effective height to regulate the quantity of coating material picked up in each of the scoop elements.

8. Apparatus according to any one of the preceding claims, wherein a conveyor is provided for feeding the articles to the inlet of the drum automatically and at a controlled rate.

9. Apparatus according to any one of the preceding claims, wherein an automatically operated hopper assembly is provided in operative relation to at least one of the supplies of coating material for automatically replenishing the said material as it is consumed in coating the articles.

10. Apparatus according to any one of the preceding claims, wherein the drum comprises a single cylindrical unit having two perforated regions therein, each perforated region being located in one of two coating zones.

11. Apparatus according to any one of the preceding claims, wherein the scoop means are arranged to effect the application of the coating material or materials to the articles within a narrow portion of each coating zone, thus enabling the pick up and return of any excess coating material to the supply thereof.

12. Apparatus for coating articles of food with edible material in flowable form, the apparatus being constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as illustrated in Figures 1, 2, 5 and 6 in combination with any one of Figures 3A—D of the accompanying diagrammatic drawings.

13. Apparatus for coating articles of food with edible material in flowable form, the apparatus being constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as illustrated in Figures 1, 2, 5 and 6 in combination with any one of Figures 3A—D and as modified according to any one of Figures 4A—C.

14. A method of coating articles with material in flowable form and comprising introducing the articles successively into a rotatable drum and simultaneously tumbling them therein by rotating the drum, causing

them to progress from an inlet at one end of the drum to an outlet at the other end thereof and causing the said material to be scooped up out of a reservoir thereof exterior to the drum and to fall under gravity on to the articles through apertures in the surface of the drum.

15. A method of coating articles with material in flowable form, the method being substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.

16. A method of coating articles of food, such as pieces of chicken, fish, scallops or the like with edible material in flowable form such as a mixture of flour and spices, cornmeal, bread crumbs, a wash consisting of a solution of water, powdered milk and powdered eggs, or like edible materials, the method being substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.

17. Articles coated in apparatus according to any one of Claims 1 to 13 or by a method according to any one of Claims 14 to 16.

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1301810 COMPLETE SPECIFICATION

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Sheet 1

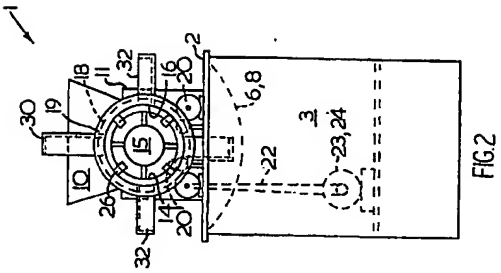

FIG.2

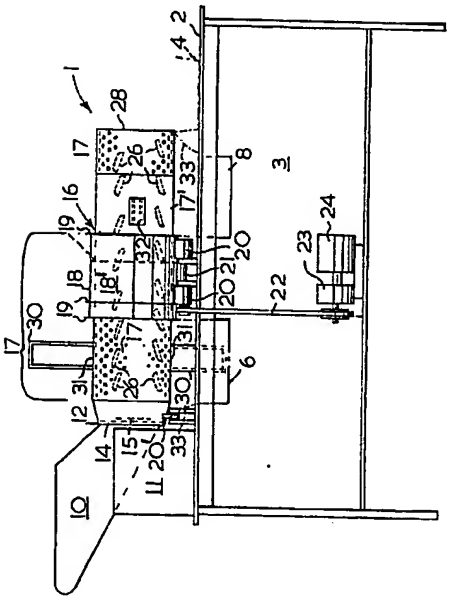

FIG.1

FIG.3A

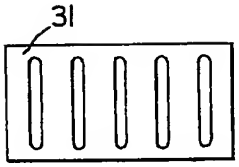

FIG.3B

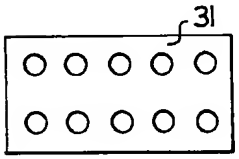

FIG.3C

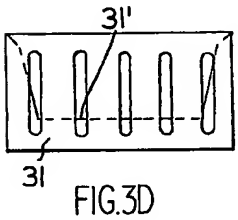

FIG.3D

1301810 COMPLETE SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 3